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EXAMINER

CHEN, KEATH T

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| ART UNIT | PAPER NUMBER |
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1709

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/574,568

Applicant(s)

YAMAGUCHI ET AL.

Examiner

Keath T. Chen

Art Unit

1709

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 April 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 04/04/2006
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

In claim 4 and 11, the term "inner circumferential surfaces" have two meanings. One is the surface including the edge of the ring (the outer circle of ring #13 of Fig. 1). Another is the inner edge of the ring, the surface facing the hole (the inner circle of ring #13). Claim 4 and 11 and their dependent claims will be examined accordingly.

Claim 10 and 13, the phrase "the support columns are provided more inside than outer circumferences of the ring-like plates" is not clear. One way to interpret this is "the support columns are provided (and are) more inside than outer circumferences of the ring like plates"; and will be examined accordingly.

Specification

1. The disclosure is objected to because of the following informalities: numerous typos (page 23, line 11, "the opening 20b be housed in the center of the opening 20b"; page 30, line 1, "the description has bee made ...").

Appropriate correction is required.

Suggestion to add "as shown in Fig. 6" at the end of 2nd paragraph on page 24.

Drawings

2. Figures 15 and 16 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the

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applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

3. Claim 8 is objected to because of the following informalities: "according t" should be "according to". Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1, 4, 10, 11, 13, and 15-18 are rejected under 35 U.S.C. 102(b) as being anticipated by Kobori et al., US 5743967, hereafter '967).

'967 teaches all limitations of claim 1:

A substrate processing apparatus (Fig. 2): a substrate holder (Fig. 1, #103) capable of holding plural substrates; a processing chamber (#201) which houses the substrates held by the substrate holder; heating means (#204) for heating the processing chamber; and gas supplying means (#202) for supplying processing gas to the processing chamber heated by the heating means, thereby processing the substrate, wherein the substrate holder includes: at least three support columns (Fig. 1, #103) provided substantially vertically; plural substrate mounting portions (not shown in Fig. 1, "trays held by support pillar", col. 2, lines 60-61) which mount the plural

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substrates substantially horizontally at a predetermined interval, the substrate mounting portions being provided at multi-stages on the support columns; and plural ring-like plates (#102) arranged on the support columns, and provided substantially horizontally at a predetermined interval with respect to the substrates supported on the substrate mounting portions.

For substantially the same reason, '967 also teaches all limitations of claim 15 (substrate holder part of claim 1).

'967 further teaches all limitations of claims 4 and 16:

Inner circumferential surfaces of the ring-like plates (Fig. 4A, the inside surface of the ring #401), the inner circumferential surfaces being opposite to the support columns (#403), are notched (#402) on a periphery of the support columns.

The examiner notes one of the meanings of "on" in Merriam-Webster dictionary definition is "to indicate position in close proximity with <a village on the sea>".

'967 also teaches all limitations of claim 17 for substantially the same reason as the claim 15 and claim 16 rejections above.

'967 also teaches all limitations of claim 11 for substantially the same reason as the claim 1 and claim 4 rejections above. Note again that "on a periphery of the support columns" is interpreted as in close proximity of the support column.

'967 also teaches all limitations of claims 10 and 13:

The support columns (Fig. 4A, #403) are provided more inside (the dotted line penetrates inside the ring) than outer circumferences (the outside of the ring) of the ring-like plates.

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'967 also teaches all limitation of claim 18, for substantially the same apparatus as claim 1, '967 also teaches the method of claim 18:

A method of manufacturing a semiconductor device: mounting the substrates on the substrate mounting portions of the substrate holder (col. 2, lines 60-61); carrying the substrates mounted on the substrate mounting portions of the substrate holder into the processing chamber (col. 2, lines 61-63); heating the processing chamber by the heating means (col. 6, lines 63-64); and supplying the processing gas to the heated processing chamber (col. 6, lines 61-63), thereby processing the substrate.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
 2. Ascertaining the differences between the prior art and the claims at issue.
 3. Resolving the level of ordinary skill in the pertinent art.
 4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
5. Claim 2, 5, and 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over '967, further in view of Minami et al. (JP 2001-168175, hereafter '175).

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'967 teaches all limitations of claim 1, as discussed above.

'967 does not teach the limitation of claims 2 and 5:

The substrate mounting portions are columnar or approximately semi-columnar in cross section.

'175 is an analogous art in the field substrate holder, particularly in heat treatment of semiconductor wafers (English translation of '175, [0006]; '967, Fig. 1 on boat and claim 1 on "uniformity" work requires attention to heat induced non-uniformity). '175 teach the use of wafer support rod (Fig. 15, #12) to have a smooth contact with wafer ([0059]) to effect controlling of slip generation ([0062]).

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to have combined '175 with '967. Specifically, to have used rod shape tray as substrate mounting portion for the purpose of reducing the thermal slip, with a reasonable expectation of success, and to have obtained the invention of claims 2 and 5.

'175 further teaches the tips of the substrate mounting portions are rounded (Fig. 5, #12), therefore, also meets the claim limitation of claim 6.

6. Claim 3 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over '967 and '175, as applied to claims 2 and 5 rejection above, further in view of Osaka et. al. (US 20020070095, hereafter '095).

'967 and '175 teaches all limitations of claims 2 and 5, as discussed above.

'967 and '175, together, do not teach the limitation of claim 3:

The substrate mounting portions are inclined downward toward an inside of the ring-like plates in a diameter direction.

'095 is an analogous art in the field of boat (Fig. 1) for semiconductor manufacturing apparatus (title), particularly in solving the problem of particle clung to the back side of the substrate ([0009], lines 1-4). '095 teaches the use of tapered mounting surface (Fig. 3A, #99) for the purpose to prevent the particles from clinging to the backs of wafers ([0198], lines 7-11).

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to have combined '095 with '967 and '175. Specifically, to have inclined the rod shape tray as substrate mounting portion for the purpose of preventing the particle clinging, with a reasonable expectation of success, and to have obtained the invention of claim 3.

7. Claim 8-9, 12, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over '967, further in view of Ishii (US 5820683, hereafter '683) and '175.

'967 teaches all limitations of claims 4 and 11, as discussed above.

'967 does not teach the limitation of claims 8 and 12:

The support columns are composed into an approximately semi-columnar shape in cross section, and the substrate mounting portions are protruded on a chord side of the support columns.

'683 is an analogous art in the field of semiconductor wafer boat, particularly in solving the problem of temperature induced slip (col. 1, col. 47-54). '583 teaches the use of semi-columnar support columns (semi-cylindrical prop, col. 3, lines 9-10) in place

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of three support columns (Fig. 1-2, prop #14-16, col. 1, lines 27-32) which tends to generate slips (col. 1, lines 56-60), in order to provide larger contact area (through the ring #36) with wafer in order to reduce the slip formation.

'175 is also an analogous art as discussed in claim 2 rejection above.

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to have combined '683 and '175 with '967. Specifically, to have changed the circular support columns ('967, #102 in Fig. 1) to the semi-cylindrical support columns as taught by '583. Furthermore, to have used rod like support as taught by '175 (#12, Fig. 5) to have replaced the substrate mounting tray (col. 2, lines 60-61) of '967 as mounting portion, to have obtained the invention of claim 8.

The examiner notes that '683 teaches an increased contact area between the mounting portion and the wafer. In the combination above, it is obvious to supply multiple support rods on each semi-cylindrical support columns (or props) as the semi-cylindrical columns (#35A-D in Fig. 5 of '683) having larger surface area to attach mounting portions; therefore, achieving increased contact area between the mounting portion and the wafer.

For claims 9 and 14, '967 teaches notch (cutouts) in the ring (Fig. 4A) near the support columns (boat pillars) for the purpose of reducing nonuniformity (col. 5, lines 56-60), as discussed in claim 4 rejection above. Furthermore, the notch is scooped out at the chord side of the support column (note, both the inner and the outer arcs of 35A-D in Fig. 5 of '683 are chords); therefore, the limitation of claim 9 and 14 are met:

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On the chord side, an inside thereof in a diameter direction of the ring-like plates is scooped out.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US 5169684 is cited for inclined mounting portion; 5651670 for rounded rod-like mounting portion; 6287112 for notch near support column; 5316472 for notch in support column for uniformity; 5316472 and 20040099219 are cited for ring-like plate; 20030077150 and 4745088 are cited for the method as in claim 18.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Keath T. Chen whose telephone number is 571-270-1870. The examiner can normally be reached on M-F, 8:30-5:00 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland can be reached on 571-272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic

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Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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MICHAEL B. CLEVELAND
SUPERVISORY PATENT EXAMINER